

1

The equation above gives the graph of a circle in the xy -plane. If the circle is inscribed in a square, what is the area of the square?

$$3x^2 + 18x + 3y^2 - 6y - 15 = 0$$

2

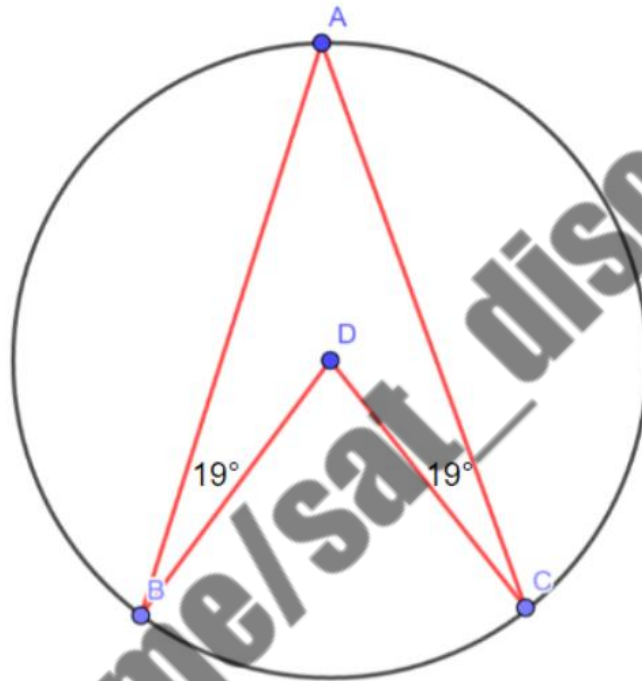
$$\frac{3}{2x+7} - \frac{4x-6}{5}$$

The above expression is equivalent to:

$$\frac{ax^2 + bx + c}{10x + 35}$$

Where a , b , and c are integer constants. What is the value of $a + b + c$?

3



The measure of angle BDC , in radians, is equal to $\frac{a\pi}{b}$ where a and b are positive integer constants. What is the smallest possible value of $a + b$?

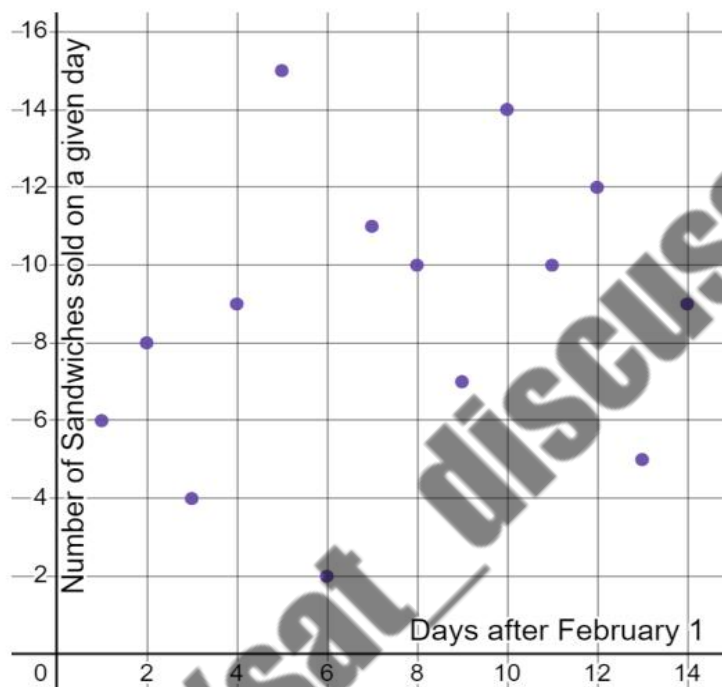
4

Point P lies on the unit circle and its position is determined by constructing an angle of $\frac{119\pi}{6}$ radians with the positive x -axis. What is the x -coordinate of Point P ?

- A) $-\frac{\sqrt{3}}{2}$
- B) $\frac{2\sqrt{3}}{3}$
- C) $\frac{\sqrt{3}}{2}$
- D) $-\frac{1}{2}$

5

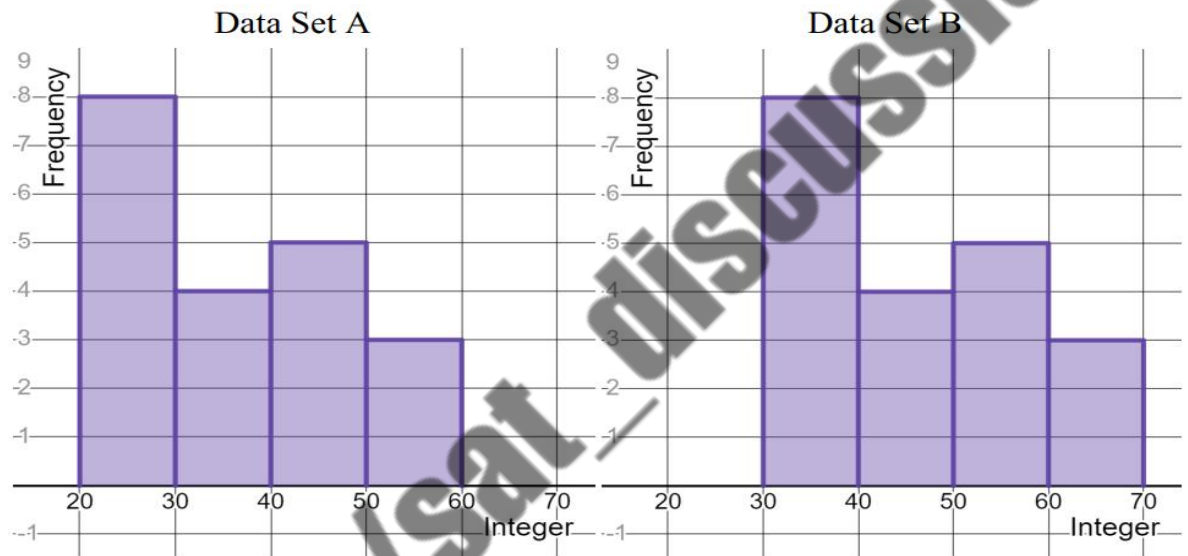
A circle in the xy -plane has the equation $(x + 3)^2 + (y - 8)^2 = 25$. Line k is tangent to the circle at $(1, 5)$. The equation for line k is represented by the linear function, $k(x)$. For what value of x does $k(x) = 12$?



The scatterplot shows the relationship between the number of sandwiches sold on a given day y , at a restaurant and the number of days after February 1, x . The average rate of change, in sandwiches per day, of the number of sandwiches the restaurant sold on February 4 to the number of sandwiches the restaurant sold on February 8 is equal to a . The average rate of change, in sandwiches per day, of the number of sandwiches the restaurant sold on February 7 to the number of sandwiches the restaurant sold on February 11 is equal to b . The number b is $p\%$ greater than the number a . What is the value of p , rounded to the nearest hundredth?

	Volume (cubic inches)
Square pyramid A	16
Square pyramid B	5488

In geometry, a square pyramid is a pyramid that has a square base and four lateral faces. Square pyramid A is similar to Square pyramid B. The table gives the volumes, in cubic inches, of the two square pyramids. If the height of Square pyramid A is 8 inches, what is the perimeter of the square base of Square pyramid B, in inches? (Round your answer to the nearest tenth of an inch).



Two data sets each containing 20 integers are summarized in the histograms shown. For the histogram, the first interval represents the frequency of integers greater than or equal to 20, but less than 30. The second interval represents the frequency of integers greater than or equal to 30, but less than 40, and so on. The mean of Data Set A is equal to a . The mean of Data Set B is equal to b . What is the smallest possible value of $\frac{b}{a}$?

9

Problem:

The expression $12x^2 + 41x + 35$ can be rewritten as $(4x + r)(3x + s)$, where r and s are integers, or as $(4x + t)(3x + v)$, where t and v are not integers. What is the value of $s + v$?

Answer Choices:

A. $\frac{41}{3}$

B. $\frac{41}{4}$

C. 12

D. 35

10

A researcher chose 40 people at random from the two streets and asked each of them how many pets he/she has. The results are shown in the table below.

Number of pets	Street A	Street B
0	7	6
1	6	8
2	5	5
3	2	1

There are a total of 300 people at Street A and 200 people at Street B.

Question: What is the median number of pets for all people in the survey?

\

11

A community advocacy group recently polled 500 people who were selected at random from a small town and asked each person, "Are you in favor of the referendum to increase the property tax rate. Of those surveyed, 67 percent stated that they were opposed to the property referendum. Which of the following statements must be true based on the results of the poll?

- I. If another 500-people selected at random from the town were polled, 67 percent of them would state they are opposed to the property tax referendum.
- II. If 500 people selected at random from a different town were polled, 67 percent of them would report they are opposed to the property tax referendum.
- III. Of all the people in the town, 67 percent are opposed to the property tax referendum.

- A) I only
- B) I and III only
- C) II and III only
- D) None

12)

Survey Results of Households

Number of children per household	Frequency
0	x
1	3
2	2
3	5
4	2

In the table above, the median number of children per household is 2. What are all possible values of x ?

Two different high schools estimated the mean dSAT Math score of all test takers who took the Digital SAT on a laptop. Perhaps viewing a bigger screen and typing on a keyboard made Desmos easier to utilize? They each selected a random sample of test takers at their high school who took the Digital SAT on a laptop and recorded their dSAT Math score. The results from each sample are shown in the table below.

Sample	Mean dSAT Math Score (points)	Margin of Error (points)
A	600	30
B	630	50

If the associated margin of error was calculated the same way for both samples, which of the following could be a possible reason that Sample B had a larger margin of error than Sample A?

- I. Sample B included fewer test takers than Sample A.
- II. Sample A had a smaller standard deviation than Sample B.

- A) I only
- B) II only
- C) Either I or II
- D) Neither I nor II

14

Two different Digital SAT test centers estimated the percentage of all test takers who took the Digital SAT on an iPad. They each selected a random sample of test takers at their center and recorded whether the test takers were using an iPad to complete the exam. The results from each sample are shown in the table below.

Sample	Percentage of test takers using an iPad	Margin of Error
A	55%	1%
B	43%	4%

If the associated margin of error was calculated the same way for both samples, which of the following is the most likely reason that the result for Sample B has a larger margin of error?

- A) Sample A included more test takers than Sample B.
- B) Sample B included more test takers than Sample A.
- C) Sample A has a greater percentage of test takers using an iPad than Sample B.
- D) Sample B was selected after Sample A.

15)

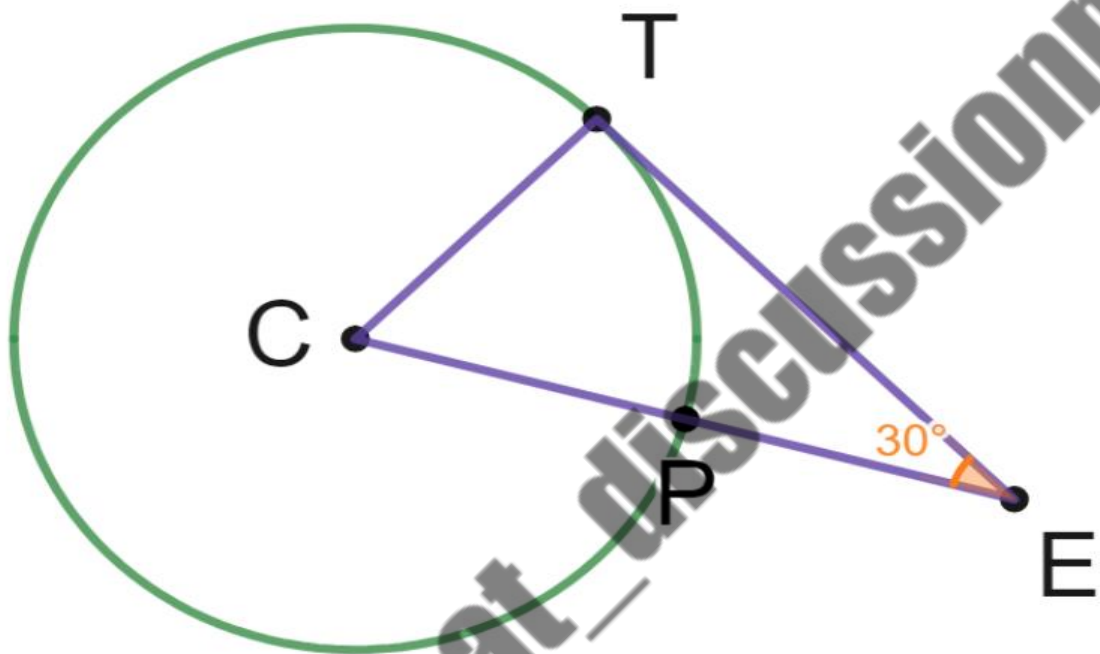
A regular hexagonal prism has a volume of 350 cubic inches and a height of 14 inches. What is the perimeter of each of the hexagonal bases, in inches? Round your answer to the nearest tenth of an inch.

16

Kyle went to buy a video game at the store. He used a 20% off coupon and there was a 6% sales tax applied at checkout. He paid \$42 at the register. What was the original price of the video game?

17)

In the figure below, line segment TE is tangent to the circle at point T . The circle has a center at point C . The measure of angle CET is 30° as shown. The length of line segment TE is 48 centimeters. What is the area of the region that is both inside the triangle and outside the circle, in square centimeters? (Use exact numbers in your answer)



18

A bathtub can hold a volume of 160 cubic decimeters. What is this volume, in cubic feet? (3.05 decimeters = 1 foot). Round to the nearest tenth.

19)

A right circular cone has a height of 10 inches as shown below. A 45-degree angle is formed by the radius and the slant height of the cone. What is the volume of the cone in cubic inches?

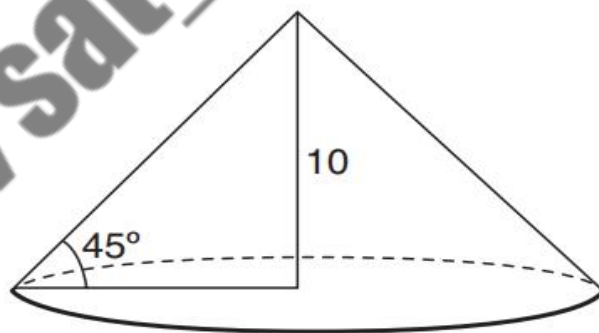
F. $\frac{100}{3}\pi$

G. $\frac{1000}{3}\pi$

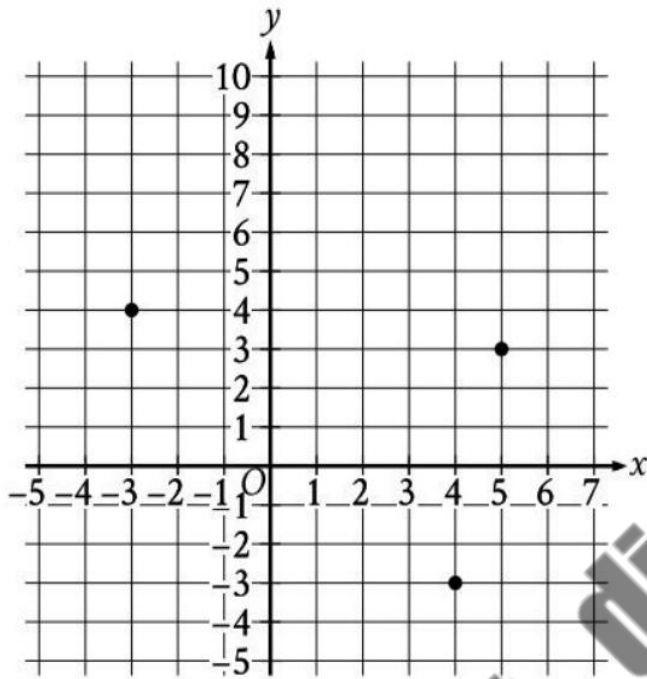
H. $\frac{2000}{3}\pi$

J. 1000π

K. 2000π



20)



What is the area, in square units, of the triangle formed by connecting the three points shown?

21)

A company developed a plan to set the selling price of a product. It determined that for a product price of \$70.00, zero products would be sold. For each \$1.50 decrease in the product price, the number of products sold would increase by one. When the revenue is \$612.50, which of the following could be the number of products sold? (Revenue = price $\times$ products sold)

22)

Two identical rectangular prisms each have a height of 87.5 centimeters (cm). The base of each prism is a square, and the surface area of each prism is K cm². If the prisms are glued together along a square base, the resulting prism has a surface area of $\frac{72}{37}K$ cm². What is the side length, in cm, of each square base?

- A) 4
- B) 8
- C) 9
- D) 10

23)

Given the function $f(x) = (x - a)(x - b)(x - c)$ where a and b are integers, find the maximum possible value of $a + b + c$ if the following conditions hold:

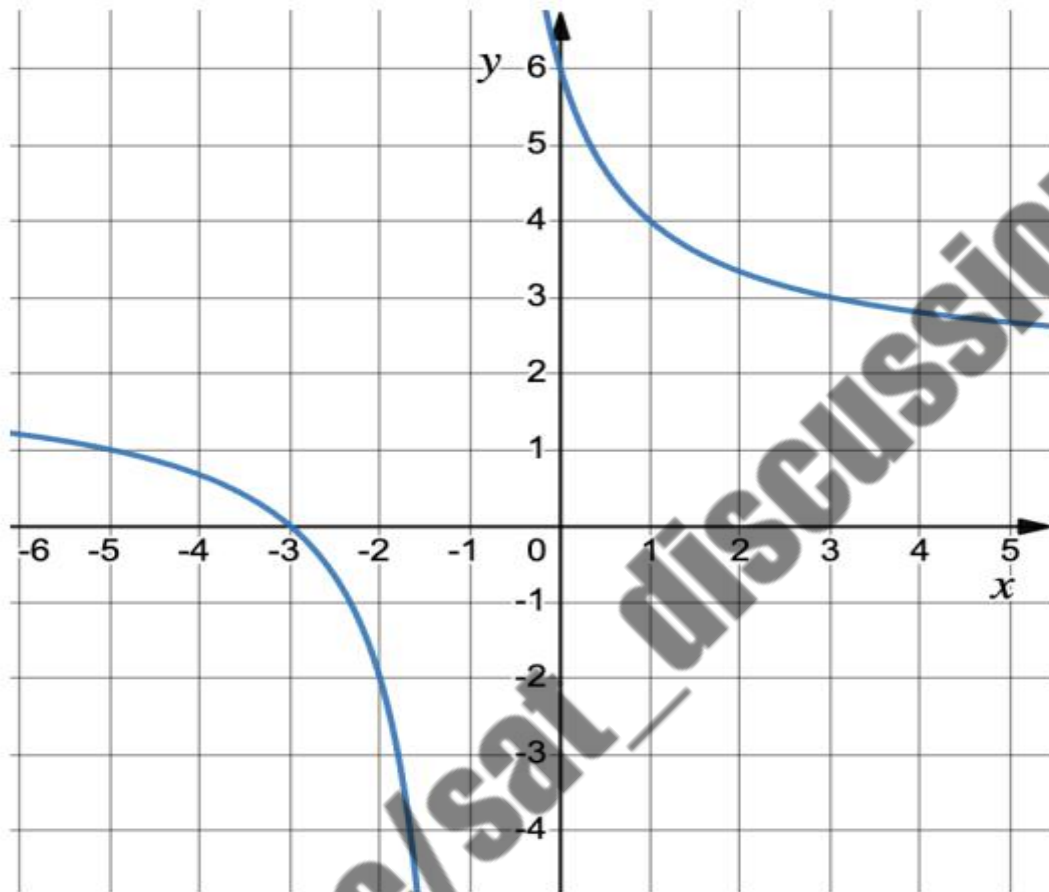
1. $f(20) > 0$
2. $f(27) < 0$
3. $f(32) > 0$

24)

The solutions to $x^2 + x - 3 = 0$ are p and q , where $p < q$. The solutions to $x^2 + 7x + 9 = 0$ are m and n , where $m < n$.

The solutions to $x^2 + 8x + c = 0$ are $(p + m)$ and $(q + n)$, where c is a constant. What is the value of c ?

25)



The graph of $f(x) = \frac{ax+b}{cx+1}$, where a , b and c are constant. What is the value of a ?

26)

$$p(x) = 3(x - 2)$$

$$q(x) = ax^2 + 2bx + 12$$

For the given polynomials, a and b are constants.

If $p(x) \cdot q(x) = 9(x^3 - 8)$, what is the value of $(a + b)$?

27)

A data set consists of 5 numbers. The minimum is 5 and the range is 25. If we delete the minimum the median will not change, but if we delete the maximum the median will decrease by 1 unit. If the mean of the data set is 15, what is the median of the data set?

28)

An object was launched to the air 10 feet from the ground. The height of the object after t seconds in the air is a quadratic function. The height of the object after 3 seconds was 58 feet. If the object reaches its maximum height in 2 seconds, what is the maximum height of the object in feet?

29)

Narmin threw a ball from a certain height from the ground. The height of the ball t seconds after in the air is a quadratic equation. The ball reached its maximum height, 211.25 meters, after 3.5 seconds. If the ball hits the ground after 10 seconds, what is the initial height of the ball, in meters?

29)

Question:

Points A $\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$ and B $\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$ are located on the unit circle with center O (0, 0). Which of the following could be the measure of angle $\angle AOB$?

Options:

A) $\frac{64}{3}\pi$

B) $\frac{73}{3}\pi$

C) $\frac{57}{3}\pi$

D) $\frac{107}{3}\pi$

30)

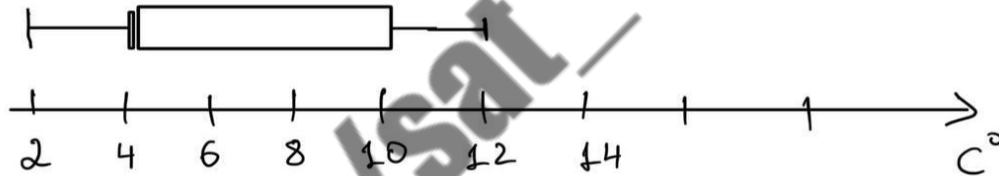
Question:

A certain radioactive substance has a half-life period of 20 days. How long, in days, will it take for its activity to reduce to $\frac{1}{16}$ of its original value?

31)

A cubic shaped metal with side length of 2 meters is used for melting. The company wants to make some spherical shaped figures with 8 cm of radius for decoration of a fountain. During melting process 9% of total volume is wasted while making perfect sphere. How many spherical shaped figures can be made from the cubic metal? (Round your answer to the nearest whole number)

32)



The given box plot shows the temperature of 20 winter days of a certain city. In how many days was the temperature more than $10^{\circ}C$?